

THE ETHNOSCIENCE OF BREM IN WONOGIRI AND ITS INTEGRATION IN SCIENCE LEARNING: AN EXPLORATORY STUDY

Arief Setyo Nugroho¹, Agustina Wahyuningsih², Retno H³, Anatri Desstya⁴, Yulia Maftuhah Hidayati⁵

¹ University of Muhammadiyah Surakarta
Sukoharjo, Central Java, 57169, Indonesia
q200210031@student.ums.ac.id

² University of Muhammadiyah Surakarta
Sukoharjo, Central Java, 57169, Indonesia
q200210032@student.ums.ac.id

³ University of Muhammadiyah Surakarta
Sukoharjo, Central Java, 57169, Indonesia
q200210033@student.ums.ac.id

⁴ University of Muhammadiyah Surakarta
Sukoharjo, Central Java, 57169, Indonesia
ad121@ums.ac.id

⁵ University of Muhammadiyah Surakarta
Sukoharjo, Central Java, 57169, Indonesia
ymh284@ums.ac.id

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ABSTRACT

The educational paradigm has tried to create a quality of education that is in line with current developments but still does not forget the character of students and the local wisdom culture of the local area. The relationship between culture and the application of science in society is studied using an ethnoscience approach. The ethnoscience approach in science learning is an approach that is expected to help students think critically and explore phenomena that occur in the environment around them. This study aims at 1) Exploration of making “brem” in Wonogiri Regency; 2) Integrating Ethnoscience in the “brem” manufacturing industry in the Basic Competencies of Elementary School Science Learning. The study was included in qualitative methods of ethnographic design by determining both material and formal research objects. Research data was collected through interview techniques, observation and documentation of primary and secondary data. Through inductive data analysis techniques with data reduction processes and data presentation, it is assumed that reliable conclusions can be drawn. The research results show that the process of making “brem” goes through many processes and stages. The process of making Wonogiri “brem” applies science knowledge which can be compared with scientific expert statements. In conclusion, the process of making g of Wonogiri “brem” has gone through a scientific process, both chemical and biological reactions. Another conclusion is that process of making “brem” can be integrated as meaningful teaching material for students in several Basic Competencies in science lesson content for grades 3 and 5 of elementary school.

Keywords: *Brem, Ethnoscience, Integration, Science, Wonogiri*

⁴ Corresponding Author

Introduction

Education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have religious spiritual strength, self-control, personality, intelligence, noble morals, and the skills needed by themselves, society, nation and state. Natural Science is intended to develop students' knowledge, understanding and analytical skills regarding the natural environment and its surroundings. Natural science is a branch of science and plays an important role in the development of science and technology, not only as a tool for the application of other fields of science, but also as a tool for the development of science itself. The fields of science, technology, and information are developing rapidly and fiercely competitively in the twenty-first century. Globalization accelerated due to the quick growth. Students may lose their identity in the future as a result of the current globalization's erosion of cultural values and local wisdom (Puspasari et al., 2019). The deteriorating state of nationalism due to foreign cultures and technology is one illustration of the detrimental effects of globalization (Asra & Akmal, 2021).

Science has a very broad overview covering all aspects of life. From a historical perspective, natural sciences grow and develop from cultural customs that are generally accepted and agreed upon. The view that science as a cultural product is a habit that is mutually agreed to be carried out as a lifestyle that develops in a society and is passed down to generations. Indonesia is famous for its diverse cultures which are the legacy of our ancestors and ancestors. Inherited culture includes the economic activities of a society. By definition, science is culture-free since it asserts that its knowledge is universal and applicable to all situations. The word ethnoscience literally means "cultural science" because the prefix ethno denotes "cultural". The majority of practicing scientists reject this idea of cultural science, which defies scientific standards. Although the term ethnoscience is still up for debate, it is a more technical phrase than native science or indigenous knowledge (Zidny & Eilks, 2022). Nonetheless, indigenous knowledge has an impact on education, as seen by the several nations that have included it into their curricula.

People's daily lives, without being directly aware of it, have applied natural science scientific principles in their lives. An approach that examines the relationship between a culture and the application of natural sciences is called

ethnoscience. The educational paradigm has tried to create a quality of education that is in line with current developments but still does not forget the character of students and the local wisdom culture of the local area. The ethnoscience approach in science learning is an approach that is expected to help students think critically and explore phenomena that occur in the environment around them. This hope is currently still wishful thinking and is inversely proportional to reality. Textual science learning requires students to memorize material from textbooks.

There is a lot of previous research related to the Ethnoscience approach. It has been proved that there is an effectiveness of an integrated science module integrated with chemistry learning ethnoscience to improve learning outcomes and foster entrepreneurial interest in junior high school students and the results are proven to be feasible and effective as teaching materials to improve science skills and learning outcomes and foster interest entrepreneurship in students. This research can be used as a reference in developing science modules in elementary schools. Furthermore, Sayekti (2019) also described that the school has unconsciously used learning with an ethnoscience approach, namely combining learning materials with the local environment and culture.

This research can be carried out further research by developing ethnoscience-oriented learning by studying the surrounding culture more deeply as a source of learning. Gusti, TS, & Sukenda (2020) stated that the development of ethnoscience in the form of multimedia learning media can improve the cognitive skills of elementary school students and the results are that students are more interested in learning because they gain meaningful experience from abstract material that students can now visualize by looking at animated images and learning videos.

It can be assumed that this research is interesting and innovative, namely by developing learning media with a digital-based ethnoscience approach in line with the demands of 21st century education. Fikri et al. (2019) also reported that the development of a chemistry learning enrichment book in high school is categorized as good and suitable for use by students. This research is interesting to use as a reference for developing enrichment books in elementary schools. Atmojo (2018) also developed integrated science learning tools with an ethnoscience approach, the results of the research were that integrated science learning tools using an ethnoscience approach could effectively improve the quality of learning, both

activities and cognitive outcomes of students. In this innovative research, it can be used as a reference in developing interesting teaching materials for students. It was interesting to study the ethnoscience because it discusses the local wisdom of the people and finds connections with learning material in elementary schools, especially the use of natural resources (Rahmawati & Atmojo, 2021).

Based on the description of the studies that are relevant to ethnoscience, it is appropriate to continue research on science learning with an ethnoscience approach, because in this research it has been explained that ethnoscience learning has improved student learning outcomes and fostered interest in entrepreneurship (Ardianti et al., 2023). By implementing ethnoscience, students also can study local culture more deeply, create the meaningful learning experience, increase the cognitive development, and find the connection between local wisdom and learning in elementary school. This research was focused in exploring in more depth the local wisdom of Wonogiri district with typical “brem” food, and finding connections with learning material in elementary schools, especially the use of natural resources, whereas the ethnoscience was integrated into the Basic Competencies of elementary school science learning. The research aims at 1) Exploration of “brem” Making in Wonogiri Regency; 2) Integrating Ethnoscience in the “brem” manufacturing industry in the Basic Competencies of Elementary School Science Learning.

Research Methods

The method used in this research is a qualitative in the ethnographic design method. Ethnography describes a society, group or human life. This research examines community activities carried out in Tenggar Hamlet, Gebang Village, Nguntoronadi District, Wonogiri Regency. The informant in the research is the “brem” manufacturer at the research site. Research objects include material objects and formal objects. The material object is the material being researched, while the formal object refers to the focus of the research. In this research, the material object is making “brem”, the formal is the science concept in integration with Basic Competencies in elementary school science learning.

Data in this research were collected in the technique of interview, observation and documentation. Interviews were conducted with “brem” production owner to find information about what materials are used to make “brem”, how to make “brem” from the start until it is ready for

consumption. Observations were carried out by visiting the place where the “brem” was made and observing the process of processing the materials for making the “brem”. Documentation is carried out to record data obtained from interviews and observations.

The data in this research are primary data and secondary data. Primary data was obtained through interviews and direct observation with informants. In addition, the secondary data is obtained from documentation/archives such as books, journals, websites related to this research as well. Triangulation techniques were carried out to check the validity of the data. Triangulation technique, namely combining data obtained from observation, interviews and documentation.

The data analysis technique uses inductive data reduction, data presentation and conclusion drawing. Researchers carry out data reduction by changing recorded data, captured images into written form, and selecting necessary and unnecessary data. To make it easier to understand this research data, the data that has been obtained is sorted and presented in the form of narrative text and tables. The final conclusion is drawn from the interpretation of the results of the analysis and verification carried out as new knowledge resulting from this research.

Results and Discussion

The process of producing “brem” in Wonogiri Regency

“Brem” in Wonogiri has become a typical food originating from Tenggar Hamlet, Gebang Village, Nguntoronadi District. Based on the results of the interview, “brem” is a processed food product that comes from sticky rice which goes through a fermentation process until sticky rice juice is obtained which in the final process has a solid form. According to the training module for making “brem”, the detailed flow of making “brem” is carried out through 13 stages, as follows:

1. Selection of Materials

This process is completed to get really good sticky rice, which means it is separated from impurities and foreign objects so that the quality of the “brem” can be guaranteed.

2. Soaking Sticky Rice

This process is done for approximately 1 to 2 hours, with the aim of making the sticky rice expand and become soft so that the cooking process is faster.

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3. Cultivation
The first step is to steam the sticky rice until the sticky rice is half cooked. The sticky rice is put into a container called tenggok.
4. Washing
After cooking it until it is half cooked, then wash it (push it) until it is clean. This aims to ensure that the sticky rice is really clean and separated from one another.
5. Steaming
The aim is to make the sticky rice cooked and soft, so that when it is processed there will be a lot of tap water.
6. Cooling
After the steaming process (the sticky rice is cooked) it is then placed/flattened on a plastic mat to cool quickly.
7. Fermentation
The cold sticky rice is then sprinkled with ground yeast so that the sticky rice becomes fermented cassava. This fermentation process is carried out for five to six days. This process aims to get maximum fermented cassava water, and later the fermented cassava water will be made into brake.
8. Press
This pressing aims to obtain fermented cassava water from fermented sticky rice. Pressing is done with a press tool which is used by turning the top lever until the press board presses down. This process is filtered using a cloth which aims to filter the fermented cassava dregs that are carried into the fermented cassava water, until the fermented cassava water is completely clear.
9. Boiling
The aim is to make the fermented cassava water boil, this process is very crucial to the quality of the “brem” itself, and each “brem” craftsman usually has their own measurements. The process of boiling sticky rice still uses a container made of brass and heated over a stone and wood stove as fuel.
10. Stirring
After the fermented cassava water is boiled and has reached the desired boiling point, the fermented cassava water is stirred until it thickens and is ready to be printed. Stirring is done using relatively modern tools. By using electrical energy, the mixing process can run faster and save human energy. This mixing takes place by operating two containers directly, so while waiting for the mixing process to finish, the craftsman can carry out other processes such as printing.
11. Thickening

This process aims to form the thickened “brem” into small dots so that it looks more attractive. The printing process still uses traditional tools, namely a printer made of rectangular wood and inside there is a round mold of the same size.

12. Drying
This process aims to make the printed “brem” dry more quickly and by getting enough heat the color of the “brem” itself will be much whiter. If the weather is cloudy or in the rainy season and does not get enough sunlight, craftsmen use an oven to dry the “brem”. However, most “brem” entrepreneurs generally still rely on sunlight for the “brem” drying process.
13. Weighing and Packaging
This process aims to find out how many (kg) “brem” are produced from how many (kg) materials used, besides that, if there is a middleman/basket, this “brem” is ready to be brought/marketed.

Previous research entitled “Increasing “brem” Production Productivity as an Effort to Raise the Potential of Wonogiri Regency” described that “brem” from Gebang Village, Nguntoronadi District is a superior product from Wonogiri Regency which has been marketed in the Solo Raya area, as well as other provinces. According to (Suseno & Wibowo, 2018), there are differences between Wonogiri, Madiun, Bali and Nusa Tenggara “brem”. Madiun “brem” is in the form of a yellowish square plate, “brem” from Bali and Nusa Tenggara or known as Lombok “brem” is liquid, not solid. The difference with Wonogiri “brem” is that the plates are round and milky white in color.

There is another research entitled Product Safety of Solid Salak “brem”. This research describes the addition of snake fruit juice to the process of making Madiun “brem”. Kurniati (2020) explained the need to develop flavors and variations of solid “brem” products so that they can be enjoyed by the wider community with different variations. In contrast to “brem”, Wonogiri is characterized by the sweet taste of sticky rice fermented cassava juice without the addition of certain flavorings or fruit juices.

Ethnoscience of “Brem” in Science Learning

Ethnoscience is a process of transforming original science which consists of all knowledge about the facts of society which originate from hereditary beliefs and still contain myths. The scope of ethnoscience covers the fields of science,

agriculture, ecology, medicine, even flora and fauna (Rahayu et al., 2015). The starting point for ethnoscience is at the local to regional level as a form of knowledge resulting from trial and error (Rist & Dahdouh-Guebas, 2006).

To find out the public’s understanding of the process of making “brem”, interviews were conducted with the community of “brem” makers which was strengthened by observation and documentation regarding the processes that occur in making “brem”. From the results of primary data collection through interviews, “brem” production owners answered questions according to their abilities and mindset so that a comparison was obtained between public science and scientific science regarding the process of making “brem”.

Table 1. Comparison of Indigenous Knowledge and Scientific Knowledge in the Process of “Brem” Production

Stages	Indigenous knowledge	Scientific knowledge
Sorting	Sticky rice produces a lot of fermented cassava water	Glutinous rice is rice which the starch contains amylopectin.
Soaking Sticky Rice	So that the sticky rice expands and becomes soft so that the cooking process is faster	As a hydration process
Fermentation/fermentation	The sticky rice is sprinkled with yeast with the aim of making the sticky rice become fermented cassava	Fermented cassava fermentation is the breakdown of starch into simple sugars

Based on the table, it is known that “brem” production owners choose sticky rice as the main ingredient because sticky rice is rice which the starch content consists mostly of amylopectin. The amylose content of white glutinous rice is 1-2% and amylopectin 88-89% (Winarno, 1984). Amylopectin is what is needed in making solid “brem”.

The sticky rice is soaked to speed up cooking, which is scientifically explained as a hydration process, namely so that the sticky rice grains absorb as much water as possible. Softens the sticky rice grains to speed up the cooking process. The most typical way of making “brem” is the fermentation process, in which steamed sticky rice is sprinkled with yeast to make it into fermented cassava. During fermented cassava fermentation, starch is broken down into simple sugars by mold, then the sugars that are formed are partly converted into alcohol by yeast; Next, some of the alcohol formed is converted into organic acid, which makes the solid “brem” product produced from processing this

fermented cassava liquid have a sweet taste, smells like alcohol and is slightly sour.

The results of the analysis show that basically the community already knows the process of making “brem” and can explain the process that occurs in making “brem” according to the knowledge they have so far. Even though the community can explain the process that occurs in making “brem” according to their current knowledge, the community’s explanation is not in accordance with the scientific explanation.

Apart from being scientifically related to science, the process of making “brem” can also be integrated with Basic Competencies in science learning material in elementary schools. Researchers correlated the activities in making “brem” with several basic competencies in elementary science learning which are then presented in the table below.

Table 2. The Integration of “Brem” in Science Learning

Activity	Class	Basic Competencies
Fermentation/fermentation	Class 3 theme 7 st 1	Development of food technology
Boiling	Class 5 theme 6 st 2	3.6 Apply the concept of heat transfer in everyday life
Stirring	Class 5 theme 2 st 1	3.4. Distinguish between various forms of energy through observation and describe their use in everyday life
Drying	Class 5 theme 6 st 2	3.6 Apply the concept of heat transfer in everyday life
	Class 5 theme 7 st1	3.7. Analyzing the effect of heat on changes in temperature and shape of objects in daily life

Science learning in elementary schools has so far focused on material in student books and teacher books or what is termed textual. Through this research, it can be assumed that the material that can be selected in learning can be applied through activities to identify local wisdom in the surrounding environment. It is expected that by identifying these activities, learning will become contextual and more meaningful for students. From

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the table above, it can be concluded that several activities in the process of making Wonogiri “brem” can be integrated into the basic competencies of elementary school science learning.

The general goals of using ethnoscience in education are to introduce and comprehend the local environment and culture; positively influence local culture through the possession of knowledge and abilities that support it; foster an attitude based on noble values; have the power to mold a nation’s character; and preserve and uphold culture (Akmal et al., 2021). Scientific research knowledge was rebuilt in ethnoscience education based on regional culture and wisdom. Knowledge was converted into described knowledge during this process from perceptions, conceptions, habits, facts, and principles. This indicates that a process of standardizing scientific terminology, concepts, descriptions, and declarative statements occurred together with the transition of validation operations (Suprpto et al., 2021).

There were various principles involved in this process of learning ethnoscience, including the relationship between the subject of the research and culture (Sumarni & Kadarwati, 2020). In addition, the existence of actual knowledge of the science of the society that will be studied to make learning more meaningful and valuable in daily life, the existence of actual scientific understanding of culture and common sense that has a place in science learning, the existence of a methodology that connects conventional knowledge to scientific knowledge, and the presence of original expertise like the phenomenological understanding of the universe of the universe (Sudarmin et al., 2019).

Implementation of ethnoscience in the learning process provides many benefits. Learning to use local knowledge inspired students to come up with original concepts (Dewi et al., 2019). Students can solve problems, gather data, generate new ideas, and solve information more effectively. Qualities of creativity and creative thought, such as awareness, are also consistent with the concepts of ethnoscience; yet, other qualities of the innovation, such as smoothness, adaptability, authenticity, and memory, remain (Irfandi et al., 2023). Because ethnoscience is a strategy to building and developing a learning environment connected with community culture, it can help students develop their creative thinking abilities by using ideas to solve environmental problems as a source of information.

Conclusion

The research aims at 1) Exploration of “brem” Making in Wonogiri Regency; 2) Integrating Ethnoscience in the “brem”

manufacturing industry in the Basic Competencies of Elementary School Science Learning. In conclusion, the process of making g of Wonogiri “brem” has gone through a scientific process, both chemical and biological reactions. Another conclusion is that process of making “brem” can be integrated as meaningful teaching material for students in several Basic Competencies in science lesson content for grades 3 and 5 of elementary school.

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